

# Cottonwood Creek Total Maximum Daily Load (TMDL) May 2000

# TMDL AT A GLANCE

Hydrologic Unit Code: South Fork of the Clearwater River #17060305

§303(d) Listed Segments: Cottonwood Creek (source to mouth) #3288; Red Rock Creek #3289, South Fork Cottonwood #3290; Long Haul Creek #5221;

Shebang Creek #5644; Stockney Creek #7288

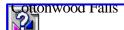
Water Quality Concerns: Sediment, Temperature, Nutrients, Dissolved Oxygen, Pathogens, Ammonia, Habitat and Flow Alteration

Designated Beneficial Uses: Secondary Contact Recreation, Agricultural Water Supply, Cold Water Biota, Salmonid Spawning

Sources Considered: Permitted Point Sources: Cottonwood WastewaterTreatment Plant

Nonpoint Sources: Agriculture, Livestock, Timber Harvest, Storm water, Roads, Septic Systems

# **EXECUTIVE SUMMARY**



Cottonwood Creek is a second order tributary of the South Fork Clearwater River located in Idaho County, Idaho. Cottonwood Creek flows from an elevation of 5,730 feet at Cottonwood Butte, east across the Camas Prairie, to an elevation of 1,332 feet at its confluence with the South Fork of the Clearwater River, near Stites, Idaho. It flows roughly from west to east and the mainstem is about 30 miles long. A waterfall approximately 9 miles upstream from the mouth of Cottonwood Creek restricts fish passage upstream. The 5 major tributaries to Cottonwood Creek are Stockney Creek, Shebang Creek, South Fork of Cottonwood Creek, Long Haul Creek, and Red Rock Creek.

The Cottonwood Creek watershed has an area of 124,439 acres. The topography of the watershed encompasses steep forested lands in the headwaters, rolling cropland associated the Camas Prairie, and

deep canyons where Cottonwood Creek dissects the Camas Prairie in the eastern half of the watershed. Land uses consist of cropland (74%), pastureland (7%), rangeland (13%), forestland (6%), and urban/industrial (<1%). A small urban area of the City of Cottonwood and a small portion of the City of Grangeville are within the watershed.

Section §303(d) of the Federal Clean Water Act requires States to develop a Total Maximum Daily Load (TMDL) management plan for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's water quality standards and allocates that load capacity to known point sources and nonpoint sources. TMDLs are the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources for nonpoint sources, including a margin of safety and natural background conditions.

In 1994, 1996, and 1998, Cottonwood Creek from its headwaters to the South Fork Clearwater was classified as a high priority water quality limited segment as a high priority water quality limited segment under 303(d) of the Clean Water Act. A TMDL was scheduled to be developed by the end of 1999. Pollutants of concern include: sediment, temperature, pathogens, nutrients, dissolved oxygen, ammonia, habitat alteration, and flow.

Three of the 5 tributaries to Cottonwood Creek were listed on the 1994 303(d) list; the two others were added on the 1998 303(d) list. The listed pollutants were a subset of those identified for the mainstem. Although the TMDLs for the tributaries are not due until 2001 or 2006, they are proactively addressed in the Cottonwood Creek TMDL as sources of pollutants to the mainstem.

The Idaho Water Quality Standards designate salmonid spawning, cold water biota, secondary contact recreation, and agricultural water supply as beneficial uses for Cottonwood Creek. 1995 and 1996 beneficial use studies indicated that Cottonwood Creek and its tributaries do not provide full support of beneficial uses because of macroinvertebrate population impairment and exceedances of water quality standards.

The primary nonpoint sources of pollutants in the Cottonwood Creek watershed are agricultural practices and runoff, livestock grazing, timber harvest activities, urban runoff, and land development activities. Storm water discharge systems, septic system failure and several other discrete sources are included with these nonpoint sources for loading analysis due to a lack of data and methodology for separate evaluation. The Cottonwood wastewater treatment plant is the only permitted point source. This plant is permitted to discharge to Cottonwood Creek November through March and land applies its wastewater during other times of the year.

Since portions of Cottonwood Creek lie within the Nez Perce Reservation, a Memorandum of Agreement was developed between the Nez Perce Indian Nation, the U.S. Environmental Protection Agency, and the State of Idaho Division of Environmental Quality to develop the TMDL, with the advice of the Cottonwood Creek Watershed Advisory Group (WAG). In the Memorandum of Agreement, the parties agreed to utilize the State of Idaho's water quality standards for development of the TMDL.

This TMDL examines whether the estimated load capacities for pollutants in Cottonwood Creek are currently exceeded. Targets, loading analyses, and load allocations are presented for sediment, temperature, nutrients/dissolved oxygen, temperature, pathogens, and ammonia.

Water quality standards for the state of Idaho are intended to provide protection of designated beneficial uses. TMDL targets are based on these water quality standards. Numeric water quality criteria are used where they exist. Narrative water quality criteria have been interpreted and applied to Cottonwood Creek for sediment and nutrients. Load capacities reflect these water quality targets for Cottonwood

Creek based on available or estimated instream flow data. Load allocations presented distribute the existing pollutant loading from both point and nonpoint sources within the watershed, based on available load capacity of Cottonwood Creek.

The following discussion explains how all the listed parameters were addressed in the TMDL. The Executive Summary Loading Table at the end of this Section summarizes pollutant and loading allocations.

#### 1.1 Sediment

Both fine sediment and coarse sediment impair salmonid spawning and rearing in Cottonwood Creek. Therefore, both fine and coarse sediment TMDL analyses were conducted.

The fine sediment TMDL analysis shows that to meet the total suspended sediment at Lower Cottonwood Creek, the suspended sediment load needs to be reduced about 60% during the critical time period of January through May. Estimated load reductions for the 5 tributaries range from 60 to 95 percent.

Bedload modeling indicates that to stabilize the streambed at bankfull discharge, the streambed stability needs to be increased about 46%. Quantitative load allocations for the coarse sediment TMDL are not specified because there is not a direct linkage between the bed stability index and sediment load. A decreasing trend toward background sediment production, transport, and delivery by subwatershed is the goal of the coarse sediment load allocation scheme. Reducing coarse sediment delivery to Cottonwood Creek and timing of peak flood flows through best management practices will help improve the water quality of Cottonwood Creek. Future analysis of sediment sources and flow impacts will be used to help develop the sediment TMDL implementation plan.

# 1.2 Temperature

The Cottonwood Creek Total Maximum Daily Load (TMDL) was established to address thermal loading (heat) for the protection of steelhead salmon spawning and other cold water biota. Mainstem Cottonwood Creek from headwaters to mouth is protected for salmonid spawning (9°C daily average, January 15 through July 15). Tributaries are required to meet cold water biota standards (19°C daily average, year-round).

This TMDL establishes percent reduction targets (instream temperature) for non-point sources in each subwatershed. These percent reduction targets are linked to "Percent Increase in Shade" targets for each subwatershed, thereby reducing the overall rate of increase in instream temperature throughout the watershed. Management activities within a watershed, such as removing riparian shade trees, harvesting of the conifer overstory, grazing in riparian areas, and introducing bedload sediment which results in increased surface area, can increase the amount of solar radiation reaching the stream.

The amount of heat energy (i.e. loading capacity) which would meet State water quality temperature standards in the creek was determined by applying a modeling technique. Model results indicate that a 30



Lower Cottonwood Creek

to 86% increase in shade is necessary in order to attain and maintain State water quality standards, depending on stream reach. It is recognized that meeting the criteria will best be accomplished by additionally promoting channel restoration that leads to a narrower, deeper

channel, colder water contributions from improved segments upstream, and/or increases in flow.

## 1.3 Nutrients/Dissolved Oxygen

Idaho's water quality criteria for nutrients states, "Surface waters of the State shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses." Impairment of recreational uses in the Cottonwood Creek watershed from excessive aquatic growth is not believed to be a problem due to low boating and swimming recreational use; however, impairment of aquatic life beneficial uses is considered to be a problem based on low dissolved oxygen levels observed in watershed streams.

The nutrient and dissolved oxygen TMDLs are combined. As part of these TMDLs, a key assumption is made that by meeting the instream nutrient target the dissolved oxygen water quality standard will be achieved as well. The TMDL establishes DO and percent saturation targets that are consistent with state water quality standards. The water quality standards states that for cold water biota, "a one day minimum of not less than 6.0 mg/L or 90% of saturation, which ever is greater." Both of these criteria are targets for Cottonwood Creek which is designated for cold water biota and salmonid spawning. The five major tributaries have not been specifically designated and are presumed to be protected for cold water biota; therefore, the DO criteria for cold water biota will be the target for these tributaries.

The nutrient TMDL used literature-derived targets for total inorganic nitrogen and total phosphorus. An averaging period of May through October was selected for estimating nutrient loading based on an assumption that this is when impairment is likely to occur and also that nutrients are not stored in the system. Since the City of Cottonwood wastewater treatment plant does not discharge during this time period, no waste load analysis and allocation was necessary. Using data collected from May 1997 through October 1997, nutrient loads and load capacities were estimated for the 5 major tributaries and lower Cottonwood Creek. Results consistently indicated significant reductions are necessary to meet the selected targets. Estimated phosphorus reductions ranged from 83 - 93%. Estimated nitrogen reductions ranged from 56 to 89%.

# 1.4 Pathogens

A BASINs nonpoint source modeling analysis was conducted for the pathogens TMDL using the State water quality criteria for fecal coliform bacteria. The mainstem of Cottonwood Creek and all tributaries were evaluated for secondary contact recreation. Red Rock was evaluated for primary contact recreation. This model estimates nonpoint souce loadings of bacteria for specific land uses in a watershed. Modeled instream bacteria concentrations were then calibrated with actual instream bacteria concentration data. Results indicated a needed load reduction ranging from 23 to 88% for the subwatershed streams. The Cottonwood WWTP is not a significant source of bacteria loading and therefore is given a WLA at its existing permitted limit. Significant sources appear to be runoff from animal wastes, septic tank failures, and cattle in streams.

### 1.5 Ammonia (Still Under Construction)

The TMDL for ammonia involved comparing total ammonia concentrations from samples collected between October 1996 and April 1998 to Idaho water quality criteria. The criteria for salmonid spawning and cold water biota are the same and vary depending upon pH and temperature conditions. Ammonia concentrations were first compared to stringent screening criteria based on worst-case temperature and pH conditions.

The existing ammonia data shows that problems exist in Upper Cottonwood Creek sub-watershed during the winter season. Ammonia concentration in this watershed increase in November and gradually decrease in March. For the Cottonwood Creek TMDL, the WLA for the Cottonwood WWTP during the critical time period (May - September) is Olbs/day because the City of Cottonwood does discharge during the this time period. Based on the available data, ammonia concentration increase during the time which the Cottonwood Creek WWTP discharges (November - April). The TMDL requires an 5% reduction in total ammonia during the November - April time period to ensure water quality standards are met. The ammonia TMDL only addressed the toxicity effects of ammonia compounds; the nutrient effects of ammonia compounds are evaluated in the nutrient TMDL.

#### 1.6 Flow and Habitat

Flow and habitat are identified on the §303(d) list as impairing uses in Jim Ford and Grasshopper Creeks. The TMDL does not address flow and habitat issues because these parameters are not currently required to be addressed under §303(d) of the Clean Water Act.

## 1.7 TMDL Implementation Plan

Within 18 months of approval of this TMDL, Cottonwood Creek WAG and supporting agencies will produce an implementation plan. This plan will specify projects and controls designed to improve Cottonwood Creek water quality by meeting the load allocations presented in this TMDL document. Implementation of best management practices within the watershed to reduce pollutant loading from nonpoint sources will be on a voluntary basis. Reductions from point sources will be addressed in revisions to discharge permits. This TMDL includes a Watershed Restoration Strategy that provides the framework for the implementation plan. It lists the types of best management practices the Cottonwood Creek WAG believes will best improve water quality. Example

Restoration Strategy that provides the framework for the implementation plan. It lists the types of best management practices the Cottonwood Creek WAG believes will best improve water quality. Example practices include prescribed grazing, alternate livestock water supplies, livestock exclusions, animal waste systems, tree and shrub planting, grassed waterways, streambank stabilization, conservation cropping and tillage practices, and protected riparian zones.

As additional information becomes available during the implementation of the TMDL, the targets, load capacity, and allocations may need to be changed. In the event that new data or information show that changes are warranted, TMDL revisions will be made with assistance of the Cottonwood Creek WAG. Because the targets, load capacity, and allocations will be re-examined and potentially revised in the future, the Cottonwood Creek TMDL is considered to be a phased TMDL. Although specific targets and

allocations are identified in the TMDL, the ultimate success of the TMDL is not whether these targets and allocations are met, but whether beneficial uses and water quality standards are achieved.

# **Executive Summary Loading Table**

Pollutant	Target	Subwatershed	Load	Load Capacity	Reduction Needed

Fine Sediment	50 mg/I TSS monthly average during critical time period (January - May)	Stockney	1,720 tons	206 tons	88%		
		Upper Cottonwood	147 tons	59 tons	60%	60%	
		Shebang	401 tons	80 tons	80%	80%	
		SF Cottonwood	1,332 tons	67 tons	95%	95%	
		Long Haul	494 tons	74 tons	85%		
		Red Rock	321 tons	116 tons	64%		
		Lower Cottonwood	4,645 tons	1811 tons	61%		
Coarse Sediment	Increase streambed stability about 46%	Bankfull width/depth ratio below 40 - 53% change					
Seaiment	Stability about 40%	Pool frequency greater than 3 pools per 100 meters - 83% change					
		Increasing trend in residual pool volume					
		Depth fines of 5 year mean not to exceed 27 percent with no individual year to exceed 29 percent and subsurface fines <0.85 mm not to exceed 10 percent					
Temperature	9°C/48°F during salmonid spawning period (January 15 - July 15)	Subwatershed	Frequently Occurring Temperature	Load Capacity	% Temperature reduction	% Shade Increase	
		Stockney	15°C/59°F	9°C/48°F	40%	47%	
	19°C/66°F during other times of the year	Upper Cottonwood	18°C/64°F	9°C/48°F	25- 50%	44%	
		Shebang	16°C/61°F	9°C/48°F	44%	76%	

		SF Cottonwood	18°C/64°F	9°C/48°F	50%	44%
		Long Haul	19°C/66°F	9°C/48°F	53%	86%
		Red Rock	18°C/64°F	9°C/48°F	50%	75%
		Lower Cottonwood	21°C/70°F	9°C/48°F	50- 57%	30%
Total Inorganic Nitrogen	0.30 mg/l during growing season of April through October	Stockney	6,596 lbs/season	1,225 lbs/season	85%	
		Upper Cottonwood	1,174 lb/season	637 Ibs/season	56%	
		Shebang	1,716 lbs/season	637 Ibs/season	70%	
		SF Cottonwood	2,527 lbs/season	752 Ibs/season	76%	
		Long Haul	1,682 lbs/season	752 Ibs/season	64%	
		Red Rock	6,412 lbs/season	836 Ibs/season	89%	
		Lower Cottonwood	32,441 lbs/season	6,470 lbs/season	91%	
Total Phosphorus	0.10 mg/l during growing season of April through	Stockney	1285 lbs/season	408 Ibs/season	91%	

	October	Upper Cottonwood	514 lbs/season	212 Ibs/season	89%
		Shebang	436 lbs/season	212 lbs/season	87%
		SF Cottonwood	842 Ibs/season	251 lbs/season	92%
		Long Haul	410 lbs/season	251 lbs/season	83%
		Red Rock	1,045 Ibs/season	279 Ibs/season	93%
		Lower Cottonwood	7,104 lbs/season	2,157 lbs/season	92%
Ammonia	IDAPA 16.01.02.250.02.c.iii	Upper Cottonwood			
	1.24 mg/l (November - April) 0.16 (May - October)	City of Cottonwood (WLA)	784 lbs/season	742 lbs/season	5%
Bacteria	10% MOS in target Point Source (City	Stockney	72,200,000 bcfu/year	20,900,000 bcfu/year	71%
	of Cottonwood) remains at existing permit limit of 100 fcu/100ml	Upper Cottonwood	28,000,000 bcfu/year	15,400,000 bcf/year	45%

	Secondary Contact Recreation: 720 cfu/100 mL	Shebang	107,000,000 bcfu/year	12,800,000 bcfu/year	88%
instantane 180 cfu/10 30-day geomean  Primary Connection Recreation Rock):	instantaneous and  180 cfu/100 ml 30-day geometric	SF Cottonwood	9,610,000 bcfu/year	7,400,000 bcfu/year	23%
	Primary Contact Recreation (Red	Long Haul	14,400,000 bcfu/year	8,930,000 bcfu/year	38%
	Rock): 450 cfu/100 ml instantaneous and	Red Rock	47,500,000 bcfu/year	15,700,000 bcfu/year	67%
	45 cfu/100 ml 30-day geometric mean target	Lower Cottonwood	168,000,000 bcfu/year	82,300,000 bcfu/year	51%

cfu - colony forming units; bcfu - billion cfu/year; lbs - pounds; °C - degrees centigrade; °F - degrees Fahrenheit; MOs - margin of safety

For more information on the executive summary, or to obtain a copy of the Cottonwood Creek TMDL or a copy of the full document, e-mail <u>John Cardwell</u> or call DEQ's Lewiston Regional Office at (208) 799-4370.

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Contact us: webmastr@deq.state.id.us

# 1410 N. Hilton, Boise, Idaho, 83706 voice: (208) 373-0502 fax: (208) 373-0417 regional office phone numbers employee directory

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